

REMARKS

Claims 1-81 are pending. Upon entry of the present response, claims 40-43, 45-53, 59-64, 66, 71-73, 75, and 81-86 will be pending, claims 40, 42, 45-48, 50, 52, 53, 59, 60, and 71-73 having been amended, claims 1-39, 44, 54-58, 65, 67-70, 74, and 76-80 canceled, and claims 82-86 added by way of the response.

The claim 45 amendment finds support regarding the “all printed electrochemical cell” in the published specification, ¶ 0076, for example, and regarding the structure of the layers in the published specification, ¶¶ 0015, 0065, 0069, 0072, 0073, for example. Dependent claims 46-48, 50, 52, 53, 59, and 60 have been amended to be consistent with amended claim 45. The claim 71-73 amendments find support in the published specification, ¶ 0106, for example. New claim 82 finds support in the published specification, ¶¶ 0073, 0076, and original claim 47, for example. New claim 83 finds support in the published specification, ¶ 0076, and original claims 47, 52, and 53, for example. New claims 84 and 85 find support in the published specification, ¶ 0119, for example. New claim 86 finds support in the published specification, ¶ 0070, for example. Accordingly, there are no issues of new matter.

Amended Specification and Drawing

In amended Fig. 2, element 78 has been renumbered “87” and element 80 has been renumbered “90” so as not to duplicate elements 78 and 80 of Fig. 3.

The specification, ¶¶ 0116, 0118, has been amended to be consistent with the Fig. 2 amendments.

There are no issues of new matter.

Allowed Claims

Claims 40-43 are allowed. Minor amendments were made to claims 40 and 42 that do not affect their allowed status.

112, 2nd Paragraph, Rejection

Claim 44 stands rejected under 35 U.S.C. 112, 2nd paragraph, as allegedly being indefinite. Claim 44 has been canceled, rendering the rejection moot. Withdrawal of the rejection is therefore requested.

Double Patenting Rejections

Claims 1-39 and 45-81 stand rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1-84 of U.S. Patent No. 7,022,431.

Claims 1-39, 54-58, 65, 67-70, 74, and 76-80 have been canceled, rendering their rejections moot. Applicants will address the remaining rejections at such time as the claims are allowed.

102 Rejections

Nitzan

Claims 39, 45-62, 64-69, 71, and 75-81 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Nitzan (US 5,652,043). Claims 39, 54-58, 65, 67-69, and 76-80 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Claim 45 as amended is directed to an all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte and a self-formed separator layer interposed between the negative pole layer and the positive pole layer.

The Office Action asserts that the claims are “either in product-by-process format, or contain recitations of how the present separator was made (‘self-form’), which are treated under product-by-process practice.” See Office Action, page 2. Applicants traverse. While not necessarily agreeing with the assertion, Applicants refer to MPEP 2113, which states that “[t]he structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art.” Here, “self-formed” provides a structural characteristic of the claimed cell. That is, the self-formed layer thickness and position, for example, in the cell may be determined by the self-forming. See, e.g., the published specification, ¶ 0072.

In contrast, Nitzan relates to an electrolyte layer adhered to a negative and a positive pole layer. See Nitzan, col. 5, ll. 10-25. Nitzan’s electrolyte layer “includes a porous insoluble substance, such as but not limited to, filter paper, plastic membrane, cellulose membrane, cloth, etc.” See *id.*, col. 5, ll. 26-28. However, Nitzan does not disclose “a self-formed separator layer interposed between said negative pole layer and said positive pole layer,” as recited in claim 45.

Moreover, as stated in the published specification, ¶ 0050, “The present invention successfully addresses the shortcomings of the presently known configurations [e.g., Nitzan] by providing a cell in which a separator layer self-forms, thereby...ensuring optimal contact between the separator layer and the pole layers.” Thus, the structure of Nitzan lacks the distinctive structural characteristics of claim 45.

For at least the above reasons, claim 45 and its dependent claims are not anticipated by Nitzan. Withdrawal of the rejections is therefore requested.

Moser

Claims 1, 6, 37, 39, 45, 50, and 81 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Moser (US 3,660,163). Claims 1, 6, 37, and 39 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Moser does not disclose at least the “all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte,” as recited in Applicants’ claim 45.

Rather, Moser relates to a solid state battery that includes a lithium anode, a solid lithium halide electrolyte layer, and an iodine cathode. See Moser, col. 1, ll. 1-3. The electrolyte layer is a structure formed in situ, not a printed structure. See *id.*, col. 2, ll. 8-16. The lithium anode is either in the form of a foil or deposited on a current collector, not a printed structure. See *id.*, col. 2, ll. 25-29. The iodine cathode is a compacted powder or a paste applied to the anode, not a printed structure. See *id.*, col. 2, ll. 33-37. Thus, the battery of Moser lacks the “all printed” structure of Applicants’ cell of claim 45.

Accordingly, claim 45 and its dependent claims are not anticipated by Moser. Withdrawal of the rejections is therefore requested.

Dixon

Claims 39, 45-53, 68, 70, and 71 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Dixon (US 4,834,772). Applicants note that the patent number “US 4,843,772” cited in the Office Action, page 3, is incorrect (emphasis added). Claims 39, 68, and 70 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Dixon does not disclose at least the “all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte,” as recited in Applicants’ claim 45.

Rather, Dixon relates to a polymeric gelled electrolyte and a method of making the same. See Dixon, Abstract. Dixon discloses that the electrolyte may be used in an electrochemical cell with an anode and a cathode. See *id.*, col. 1, ll. 42- 50. The gelled electrolyte is a structure formed in situ, not a printed structure. See *id.*, col. 1, ll. 44-50. Dixon is silent about the structures of the anode and cathode, other than to describe the materials from which they are made. See *id.*, col. 2, ll. 62-66. Thus, the structure disclosed in Dixon lacks the “all printed” structure of Applicants’ cell of claim 45.

Accordingly, claim 45 and its dependent claims are not anticipated by Dixon. Withdrawal of the rejections is therefore requested.

Manganaro

Claims 39, 45, 50-52, 68, and 70 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Manganaro (US 5,155,144). Claims 39, 68, and 70 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Manganaro does not disclose the “all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte and a self-formed separator layer interposed between said negative pole layer and said positive pole layer,” as recited in Applicants’ claim 45.

Rather, Manganaro describes a polysaccharide-based porous sheet that may be used in a battery to separate the anode and cathode. See Manganaro, col. 2, ll. 63-64. The porous sheet is introduced in a conventional manner between the anode and cathode. See *id.*, col. 18, ll. 18-57. The porous sheet is not a self-formed structure, as in Applicants’ self-formed separator layer. Moreover, the porous sheet is a composition formed by a reaction of materials, not a printed structure. See *id.*, col. 7, ll. 14-59. Manganaro is silent about the structures of the anode and cathode. Thus, the structure disclosed in Manganaro lacks the “all printed” structure of Applicants’ cell of claim 45.

Accordingly, claim 45 and its dependent claims are not anticipated by Manganaro. Withdrawal of the rejections is therefore requested.

Denton

Claims 39, 45, 52, 54, and 65 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Denton (US 5,962,168). Claims 39, 54, and 65 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Denton does not disclose the “all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte and a self-formed separator layer interposed between said negative pole layer and said positive pole layer,” as recited in Applicants’ claim 45.

Rather, Denton describes an electrochemical cell that includes an anode, an electrolyte system, and a cathode. See Denton, col. 2, l. 29 – col. 3, l. 10. The electrolyte system includes an electrolyte active species dispensed in a polymer gel electrolyte support structure, not a printed structure. See, *id.*, col. 3, ll. 6-9. The anode is a layer of active material, such as a carbon material, deposited on a substrate. See *id.*, col. 2, ll. 48-50. However, Denton does not disclose that the anode material is printed on the substrate. The cathode is a layer of cathode active material disposed on a cathode substrate. See *id.*, col. 2, l. 66 – col. 3, l. 1. However, Denton does not disclose that the cathode material is printed on the substrate. Thus, the electrochemical cell of Denton lacks the “all printed” structure of Applicants’ cell of claim 45. Moreover, Denton does not disclose a self-formed separator layer, as in Applicants’ claim 45.

Accordingly, claim 45 and its dependent claims are not anticipated by Denton. Withdrawal of the rejections is therefore requested.

Kolb

Claims 39, 45, 54-56, and 59 stand rejected under 35 U.S.C. 102(a) and (e) as allegedly being anticipated by Kolb (US 6,080,282). Claims 39 and 54-56 have been canceled, rendering their rejections moot. Applicants traverse the remaining rejections.

Kolb does not disclose the “all printed electrochemical cell comprising a printed negative pole layer, a printed positive pole layer, a printed electrolyte and a self-formed separator layer interposed between said negative pole layer and said positive pole layer,” as recited in Applicants’ claim 45.

Rather, Kolb discloses an electrolyte gel that may be placed between two electrodes in an electrolytic cell. See Kolb, col. 4, l. 38 – col. 5, l. 5. The electrolytic cell is formed by first fabricating a electrolyte solution, applying the solution to a first electrode material, curing the solution and the material, thereby forming the electrolyte gel, and then applying a second electrode material to the gel. See *id.* The gel is not a printed structure. Kolb is silent about the structure of the two electrodes. Thus, Kolb's structure lacks the "all printed" structure of Applicants' cell of claim 45. Moreover, Kolb indicates that the gel "obviates the need for mechanical separators...which are often placed between electrodes of an electrolytic cell to maintain separation of the electrodes." See *id.*, col. 5, ll. 37-43. Thus, Kolb does not disclose a self-formed separator layer, as in Applicants' claim 45.

Accordingly, claim 45 and its dependent claims are not anticipated by Kolb. Withdrawal of the rejections is therefore requested.

103 Rejections

Nitzan

Claim 63 stands rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Nitzan. Applicants traverse the rejection.

Applicants' claimed invention includes a self-formed separator layer. Accordingly, claim 45 is patentable over Nitzan. Claim 63 is also patentable over Nitzan by virtue of its dependency from claim 45. Withdrawal of the rejection is therefore requested.

Moser in view of Nitzan

Claim 43 stands rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Moser in view of Nitzan. Applicants believe that this rejection was intended to refer to claim 44 because the rejection refers to the claim as directed to printing technology, which is in claim 44, not claim 43. See Office Action, page 6. Also, claim 43 is indicated as allowed. Accordingly, Applicants respond to this rejection with respect to claim 44.

Claim 44 has been canceled, rendering the rejection moot. Withdrawal of the rejection is therefore requested.

New Claims

New claims 82 and 83 are directed to all printed electrochemical cells comprising, *inter alia*, a self-formed separator layer interposed between negative and positive pole layers. Claims 82, 83, and dependent claim 85 are believed to be patentable over the cited references for at least the reasons set forth above.

New claim 84 is directed to an electrochemical cell with controllable properties comprising, *inter alia*, an integral and in-situ formed interfacial separator layer disposed between negative and positive pole layers, where at least one property of the separator layer is controlled by selection of electrolyte solution components in the pole layers to facilitate controlling electrical and physical properties of the cell. The controlled integral and in-situ formed interfacial separator layer is believed to be patentable over the cited references.

New claim 86 is directed to the all printed electrochemical cell of claim 45 in which there is no separately added separator. Claim 86 is believed to be patentable over the cited references for at least the reasons set forth above with respect to claim 45.

CONCLUSION

The claims are believed to be allowable. Favorable action to that effect is respectfully requested.

The Examiner is invited to contact the undersigned at 202.220.4200 to discuss any issues regarding this application.

The Office is authorized to charge any fees or credit any overpayment associated with this filing to Deposit Account No. 11-0600.

Respectfully submitted,
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